

WHAT IS CLAIMED IS:

1. A speech synthesizing apparatus comprising:

storage means for storing plural items of phoneme data;

5 retrieval means for retrieving phoneme data, in accordance with given retrieval conditions, from the plural items of phoneme data stored in said storage means;

10 first penalty assigning means for assigning a penalty that is based upon an attribute value to each item of phoneme data retrieved by said retrieval means; and

15 selection means for selecting, from the phoneme data retrieved by said retrieval means, and based upon the penalty assigned by said first penalty assigning means, phoneme data to be employed in synthesis of a speech waveform.

20 2. The apparatus according to claim 1, wherein said storage means stores respective items of attribute information together with the plural items of phoneme data; and

said first penalty assigning means obtains an attribute value from the attribute information stored in said storage means.

25 3. The apparatus according to claim 2, wherein the attribute information includes phoneme environment,

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phoneme boundary, fundamental frequency, power and phoneme duration.

4. The apparatus according to claim 1, wherein said retrieval means retrieves phoneme data that satisfies a specified phoneme environment.

5. The apparatus according to claim 1, wherein said retrieval means retrieves phoneme data that satisfies a specified phoneme environment and fundamental frequency.

6. The apparatus according to claim 1, wherein said first penalty assigning means sorts retrieved phoneme data based upon a prescribed attribute value and assigns a penalty value on the basis of order obtained by sorting.

7. The apparatus according to claim 1, wherein said first penalty assigning means assigns a penalty using power and phoneme duration of each item of phoneme data as the attribute values.

8. The apparatus according to claim 1, wherein said first penalty assigning means:

20 sorts the items of phoneme data in order of decreasing power and assigns a power-related penalty on the basis of the order obtained by sorting, in such a manner that a small penalty is assigned to phoneme data whose power is close to an average value; and

25 sorts the items of phoneme data in order of decreasing phoneme duration and assigns a phoneme-

duration-related penalty on the basis of the order obtained by sorting, in such a manner that a small penalty is assigned to phoneme data whose phoneme duration is close to an average value.

5 9. The apparatus according to claim 1, further comprising:

alternate retrieval means for retrieving phoneme data that satisfies some of the retrieval conditions in a case where phoneme data that conforms to the retrieval
10 conditions in said retrieval means does not exist;

counting means for grouping phoneme data, which has been retrieved by said alternate retrieval means, on the basis of a phoneme environment, and counting the items of phoneme data on a per-group basis; and

15 second penalty assigning means for assigning a penalty on the basis of a count obtained by said counting means to the phoneme data retrieved by said alternate retrieval means, this penalty being assigned in addition to the penalty assigned by said first
20 penalty assigning means.

9 ~~10~~. The apparatus according to claim ~~9~~⁸, wherein the retrieval conditions include phoneme environment; and

said alternate retrieval means retrieves phoneme data which agrees with part of a phoneme environment
25 specified in the retrieval conditions.

10 ~~11~~. The apparatus according to claim ~~10~~⁹, wherein the

phoneme environment specified in the retrieval conditions is a triphone composed of an applicable phoneme and phonemes on both sides thereof; and

said alternate retrieval means retrieves phoneme
5 data for which the applicable phoneme and its left side phoneme agree with the retrieval conditions, or phoneme data for which the applicable phoneme and its right side phoneme agree with the retrieval conditions.

12. A speech synthesizing method comprising:

10 a storage step of storing plural items of phoneme data;

a retrieval step of retrieving phoneme data, in accordance with given search retrieval conditions, from the plural items of phoneme data stored at said storage
15 step;

a first penalty assigning step of assigning a penalty that is based upon an attribute value to each item of phoneme data retrieved at said retrieval step; and

20 a selection step of selecting, from the phoneme data retrieved at said retrieval step, and based upon the penalty assigned at said penalty assigning step, phoneme data employed in synthesis of a speech waveform.

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13. The method according to claim ¹¹12, wherein said
25 storage step stores respective items of attribute information together with the plural items of phoneme

data; and

said first penalty assigning step obtains an attribute value from the attribute information stored at said storage step.

- 5 14. The method according to claim ¹³~~12~~, wherein the attribute information includes phoneme label, phoneme boundary, fundamental frequency, power and phoneme duration.

- 14 15. The method according to claim 11, wherein said
10 retrieval step retrieves phoneme data that satisfies a
specified phoneme environment.

- ~~16.~~¹⁵ The method according to claim ~~12~~¹¹, wherein said retrieval step retrieves phoneme data that satisfies a specified phoneme environment and fundamental frequency.

- 15 17. The method according to claim 12, wherein said first penalty assigning step sorts retrieved phoneme data based upon a prescribed attribute value and assigns a penalty value on the basis of order obtained by sorting.

- 20 18. The apparatus according to claim 12, wherein said first penalty assigning step assigns a penalty using power and phoneme duration of each item of phoneme data as the attribute values.

19. The method according to claim 18, wherein said
25 first penalty assigning step:

sorts the items of phoneme data in order of

21.9 The method according to claim 20, wherein the
retrieval conditions include phoneme environment; and
said alternate retrieval step retrieves phoneme
data which agrees with part of a phoneme environment
5 specified in the retrieval conditions.

22. The method according to claim 21, wherein the
phoneme environment specified in the retrieval
conditions is a triphone composed of an applicable
phoneme and phonemes on both sides thereof; and
10 said alternate retrieval means retrieves phoneme
data for which the applicable phoneme and its left side
phoneme agree with the retrieval conditions, or phoneme
data for which the applicable phoneme and its right side
phoneme agree with the retrieval conditions.

23. A storage medium storing a control program for
causing a computer to execute speech synthesis using
phoneme data, said control program having:

code of a storage step of storing plural items of
phoneme data;
20 code of a retrieval step of retrieving phoneme
data, in accordance with given search retrieval
conditions, from the plural items of phoneme data stored
at said storage step;

code of a first penalty assigning step of assigning
25 a penalty that is based upon an attribute value to each
item of phoneme data retrieved at said retrieval step;

decreasing power and assigns a power-related penalty on the basis of the order obtained by sorting, in such a manner that a small penalty is assigned to phoneme data whose power is close to an average value; and

5 sorts the items of phoneme data in order of decreasing phoneme duration and assigns a phoneme-duration-related penalty on the basis of the order obtained by sorting, in such a manner that a small penalty is assigned to phoneme data whose phoneme duration is close to an average value.

10 20. The method according to claim 12, further comprising:

an alternate retrieval step of retrieving phoneme data that satisfies some of the retrieval conditions in a case where phoneme data that conforms to the retrieval conditions at said retrieval step does not exist;

15 a counting step of grouping phoneme data, which has been retrieved at said alternate retrieval step, on the basis of a phoneme environment, and counting the items of phoneme data on a per-group basis; and

20 a second penalty assigning step of assigning a penalty on the basis of a count obtained at said counting step to the phoneme data retrieved at said alternate retrieval step, this penalty being assigned in addition to the penalty assigned at said first penalty assigning step.

and

code of a selection step of selecting, from the phoneme data retrieved at said retrieval step, and based upon the penalty assigned at said first penalty

5 assigning step, phoneme data employed in synthesis of a speech waveform.

24. The storage medium according to claim 23, wherein said control program further has:

code of an alternate retrieval step of retrieving
10 phoneme data that satisfies some of the retrieval conditions in a case where phoneme data that conforms to the retrieval conditions at said retrieval step does not exist;

code of a counting step of grouping phoneme data,
15 which has been retrieved at said alternate retrieval step, on the basis of a phoneme environment, and counting the items of phoneme data on a per-group basis; and

code of a second penalty assigning step of
20 assigning a penalty on the basis of a count obtained at said counting step to the phoneme data retrieved at said alternate retrieval step, this penalty being assigned in addition to the penalty assigned at said first penalty assigning step.